Remarks

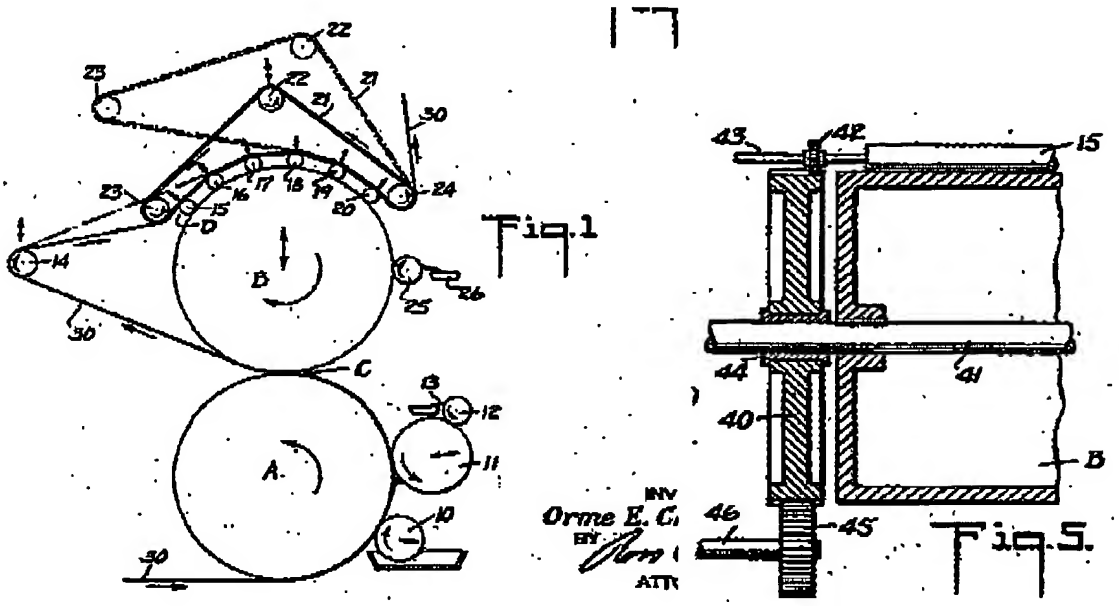
Applicants have amended claims 1-4 as shown above. Support for these amendments can be found in the Written Description at, e.g., page 4, lines 3-6 and 23-24; page 9, lines 9-11; and page 25, lines 22-24. Claims 1-4 are pending in this application.

Rejection of Claims 1-4 under 35 USC §103(a) and Cheatham

Claims 1-4 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 2,053,601 (Cheatham), on grounds *inter alia* that:

> *"Cheatham teaches a smoothing station for improving uniformity of a wet coating on a substrate having a direction of travel or motion comprising (a) two or more reciprocating pick and place devices (15-20) that rotate in the direction of travel or motion (see pg. 4, lines 3-9 and lines 21-29) or (b) four or more reciprocating pick and place devices (15-20) that rotate counter to the direction of motion (see pg. 4, lines 3-9 and lines 21-29), the peripheral surfaces of the devices (a) or (b) being at different positions along the substrate (pg. 4, lines 41-51). Even though Cheatham is silent concerning the pick and place devices contacting and recontacting the substrate while smoothing so as to effect different lengths of contact along the coating to improve uniformity, it would have been inherent or in the alternative obvious to one of ordinary skill in the art that the Cheatham smoothing station would enable variations in lengths of contacting and recontacting along the substrate because the smoothing rollers (i.e., pick or place devices) can be driven at different speeds relative to the speed of travel of the web as evidenced by pg 4, lines 22-30. One skilled in the art would recognize and appreciate that different lengths of contacting/recontacting of the coated substrate would be effected via variation in speed of rotation of the smoothing rollers and/or variation in speed of travel of the web or substrate."* (see the Office Action at pages 2-3).

Reconsideration is requested. Whether driven by felt **21** shown in **Fig. 1**, reproduced below, or by gears **40, 42** and **45** shown in **Fig. 5**, reproduced below, Cheatham's smoothing rolls **15** through **20** have identical diameters and rotate at identical surface speeds:



Cheatham's smoothing rolls **15** through **20** would thus at best contact and re-contact Cheatham's web **30** at positions whose lengths along the web with respect to a first contacting position are all the same. Cheatham does not disclose an apparatus with "three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another".

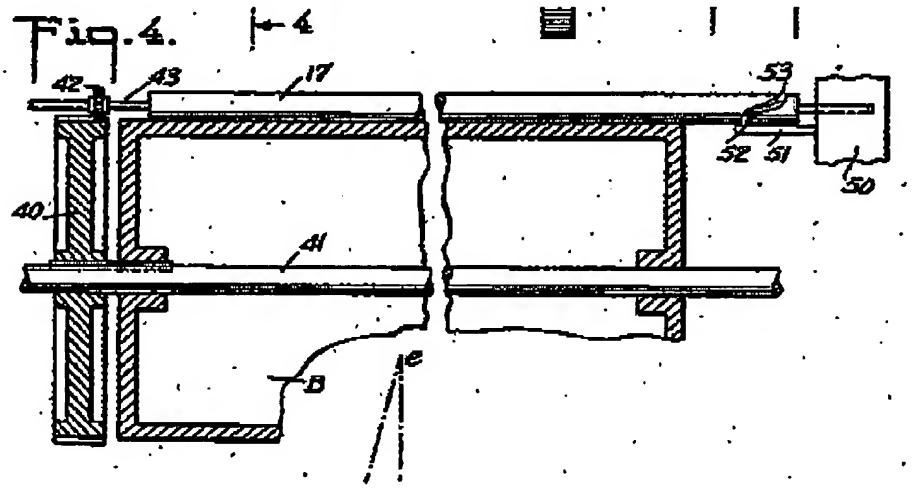
The Office Action also asserts that:

> *"With respect to the contacting periods improving uniformity along the longitudinal direction of the travel of the web, the Cheatham device inherently enables uniformity along the direction of travel of the coated web as evidenced by pg. 4, lines 37-41."* (see the Office Action at page 3).

Reconsideration is requested. The cited "longitudinal direction" refers to the central axes of rolls **15** through **20**, and not to the direction of substrate motion, see page 4, lines 30-51 and **Fig. 4**, reproduced below:

> *"Regardless of the direction of rotation of the smoothing rolls, it is desirable to reciprocate the rolls longitudinally under some conditions. To accomplish this at*

least one bearing 50 of each smoothing roll may be supplied with an arm 51 carrying a pin 52 projecting into a slot 63 in the smoothing roll. The pitch of slot 53 determines the longitudinal movement of the roll. The effect of this device is to cause rubbing and further smoothing of the coating upon the web, and to prevent or break up uneven accumulations of the film upon roll B. In order to accommodate the longitudinal reciprocations of the rolls, gear 40 is relatively broad so that gears 42 will always remain in mesh therewith. In the assembling of the mechanism, the gear 42 of each roll may be brought into mesh with gear 40 at a relatively different position so that at any instant each pin 52 will be in a relatively different position in its slot 53, with the result that each smoothing roll may be travelling in a different direction, or at least will be at a different position."



The Office Action also asserts that:

"With respect to the number of smoothing rollers used, see pg. 3, lines 18-22." (see the Office Action at page 3).

Reconsideration is requested. The cited Cheatham passage says that:

"Mounted above roll B are a plurality of spaced smoothing rolls resting upon the upper surface of roll B. I have illustrated six rolls, numbered 15 to 20 inclusive, but any desired number may be used."

The illustrated rolls **15** to **20** are all the same diameter and turn at the same speed. Cheatham also says that "the same conditions exists throughout any surface element of each smoothing roll" (see page 3, lines 35-39). Cheatham's rolls **15** to **20** would merely repropagate, not reduce, coating defects in the direction of substrate motion (see applicants' written description at, e.g. page 10, line 20 through page 11, line 20, page 12, lines 7-12 and Fig. 5).

Cheatham does not show or suggest an apparatus with "three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another". Applicants accordingly request withdrawal of the 35 USC §103(a) rejection of claims 1-4 as being unpatentable over Cheatham.

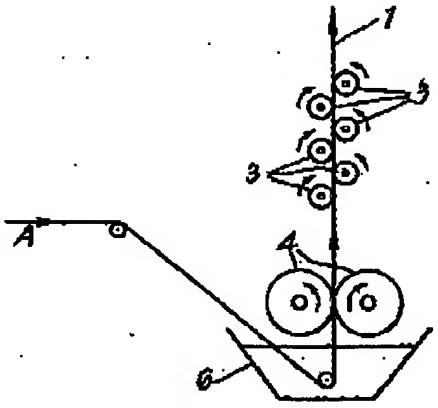
Rejection of Claims 1-4 under 35 USC §103(a) and Hall

Claims 1-4 were also rejected under 35 USC §103(a) as being unpatentable over U.K. Patent No. 1,278,099 (Hall), on grounds *inter alia* that:

> *"Hall teaches an apparatus for improving uniformity of a liquid coating on a substrate comprising the combination of at least two or more pick-and-place devices (3; col. 1, lines 41-46) that rotationally move counter to the direction of travel of the substrate, the pick and place devices periodically contacting the coating and re-contact said coating along lengths of the substrate, the pick and place travel at different positions including the direction of travel of the substrate (see Fig. 3) or the axial direction (see Fig. 4) wherein the pick-and-place devices are out of phase with one another (see claim 5) constituting non-periodically related devices. Even though Hall does not explicitly teach different lengths or distances along which the pick-and-devices contact and recontact the coating on the substrate, one of ordinary skill in the art would expect that the contacting distances or lengths of the devices would be different because the devices are translated or moved out of phase with one another such that the devices are not periodically related along the direction of travel of the substrate. Moreover, the apparatus of Hall can be adjusted such that the amplitude*

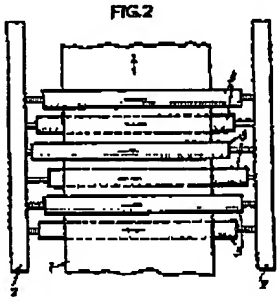
and frequency of the reciprocating motion of the smoothing rollers (i.e., pick and place devices) can be varied widely with a reduced amplitude and an increased frequency (see col. 3, lines 19-34) such that a variety of lengths of contacting/recontacting of the coating can result along the coated substrate." (see the Office Action at pages 3-4).

Reconsideration is requested. Hall uses a bath 6 and metering (squeeze) rollers 4 to apply a coating and then employs counterrotating rollers 3 to flatten out longitudinal striations on web A (see e.g., page 1, lines 25-28 and page 1, line 92 through page 2, line 37) and Hall's Fig. 1, reproduced below:



Applicant's claims 1-4 recite an improvement station "comprising three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another". Hall does not show such a device. As acknowledged in the Office Action, "Hall does not explicitly teach different lengths or distances along which the pick-and-devices contact and recontact the coating on the substrate". Hall does not disclose or suggest operating the rollers 3 at different rates of speed or with different periods of contact. Hall also does not disclose or suggest vibrating the rollers 3 in the direction of substrate motion and out of phase with one another.

A person having ordinary skill in the art who reviewed Hall would recognize that Hall's description of out of phase continuous movement (and Hall's description of a mechanical arrangement to carry out such out of phase continuous movement) involves only crossweb reciprocation. Hall says he dealt with a particular form of cyclic variation in sideways smearing observed when two of the three rollers **3** per side in his support structure **2** are axially reciprocated. Hall describes this cyclic variation and his solution as follows (see **Fig. 2**, reproduced below, and page 2, lines 18-55, emphasis added):



*"It is this widening out and thinning of the striations which results in a smoother coating, and the initial improvement imparted by the present reciprocating movements is believed to be due to a sideways thrust imparted to the puddle, thus increasing its effective width and reducing its thickness still further. **A secondary effect is that the then largely flattened stripe of coating liquid carried on the surface of the roller is given a sinuous path when transferred to the rising film and the next roller in line is not therefore called upon to deal with a simple vertical stripe. This angular attack of the second roller can be enhanced by arranging the reciprocations of the second roller to move at the same speed but out of phase with those of the first.** The effect of this angular attack is still further to spread the surface irregularities, with consequent improvement of smoothness.*

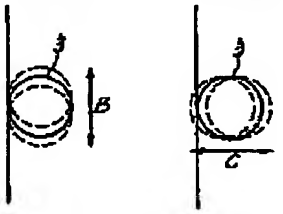
*"**If, however, the horizontal movements of the two smoothing rollers, which are vertically aligned, are arranged in a completely opposite sense, cyclic variations in effect occur.** This is due to the fact that **the reciprocating movements must, for mechanical reasons, be largely or completely harmonic**, so that at the mid-position of the two rollers the sideways smearing effect is at a maximum, whilst near the end-positions*

where the motions are reversed, there is little or no sideways-smear effect. ***For this reason, a preferred arrangement is to employ at least three smoothing rollers on each side of the film, each reciprocating at similar speeds and with similar amplitudes but out of phase insofar that at any given moment, one of the rollers is always at or near its maximum horizontal speed and effectiveness."***

Hall also describes a vertical camshaft arrangement that could be used to cause such out of phase reciprocal axial movement (see e.g., page 2, line 104 through page 3, line 18). Hall says that such out of phase reciprocal axial movement is preferred [see e.g., page 1, lines 87-89 and page 2, lines 48-55 (quoted above)], and says that the reason for using out of phase reciprocal axial movement is to overcome cyclic variation in the sideways smearing effect.

Hall separately describes non-axial roller motions that he calls "vibration" rather than reciprocal movement (see e.g., page 1, lines 80-86, page 3, lines 19-37, **Fig. 3** and **Fig. 4** which are reproduced below):

FIG.3 FIG.4



Hall does not disclose vibrating the rollers **3** along axis **B** or axis **C** out of phase with one another, and does not disclose any mechanical arrangement for doing so. If asked to consider the matter (applicants do not concede that any such consideration would be warranted), a person having ordinary skill in the art would assume that because the rollers **3** are mounted in support structure **2**, they would vibrate together (as with the recited reciprocating movements, such vibrations would, using Hall's words, "for mechanical reasons, be largely or completely harmonic"). If asked to consider the matter (applicants again do not concede that any such consideration would be warranted), a person having ordinary skill in the art would also assume that the rollers **3** could most conveniently be caused to vibrate along axis **B** or axis **C** by vibrating support structure **2** rather than the individual rollers **3**. A person having ordinary

skill in the art would not find any reason or motivation in Hall to vibrate the rollers 3 out of phase with one another. Doing so would require that each roller 3 be isolated from support structure 2 and could compromise the precision clearances required for the vertical camshaft and gears described at page 2, line 113 through page 3, line 2 to impart Hall's recited counterrotating roller drive and Hall's recited cross-web reciprocal roller motion.

Notwithstanding the assertion in the Office Action, Hall's claim 5 does not teach "pick and place travel at different positions including the direction of travel of the substrate (see Fig. 3) or the axial direction (see Fig. 4) wherein the pick-and-place devices are out of phase with one another". Hall's Claim 5 depends from Hall's claim 4 which recites that the continuous roller movement "comprises reciprocation in an axial direction". As explained above, Hall's axial reciprocation is a crossweb motion and is the only out of phase motion described in Hall. A person having ordinary skill in the art would not "expect that the contacting distances or lengths of the devices would be different" and would not expect "that the devices would be translated or moved out of phase with one another such that the devices are not periodically related along the direction of travel of the substrate". No proper basis for such conclusions is provided in Hall.

The cited passage at col. 3, lines 19-34 nowhere says or suggests "that a variety of lengths of contacting/recontacting of the coating can result along the coated substrate". Hall does not disclose or suggest a mode of operation that would provide "three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another" as recited in applicants' claim 1.

The Office Action also asserts that:

> *"With respect to claims 3 and 4, Hall recognizes two or even five pick-and-place devices being (see col. 1, lines 41-46)."* (see the Office Action at page 2, third paragraph).

Reconsideration is requested. Hall does not disclose or suggest using "a train of four or more rolls of different sizes" (see applicants' amended claim 4) or "a train of five or more rolls of

different sizes" (see applicants' amended claim 5). Hall uses three equally-sized counterrotating rollers to overcome the above described cyclic variation in the sideways smearing effect. Hall does not disclose or suggest using rolls of different sizes, let alone four or more or five or more such rolls. The cited passage at page 1, lines 41-46 merely says that "in one difficult case it has even been proposed that a minimum of five rollers per side be employed". This passage apparently refers to a prior device and not to Hall's reciprocating apparatus. The cited page 1 proposal is not further described but presumably would involve a device having counter-rotating rollers that all have the same size and turn at the same speed. Hall does not disclose the subject matter of claim 3 or claim 4.

The Office Action also asserts that:

"In addition, all the pick-and-place devices can be moved out of phase with one another such that the devices are not periodically related as evidenced by col. 1, lines 80-89." (see the Office Action at page 2, third paragraph).

Reconsideration is requested. The cited passage at page 1, lines 80-89 uses the terms "reciprocated" to refer to axial motion transverse to the direction of substrate motion, and "vibrated" to refer to motion in other than an axial direction. Hall refers to out of phase motion only in connection with axially reciprocated rollers:

*"In one embodiment of the invention the or each roller is both **reciprocated in its axial direction transverse to the direction of travel of the film** and caused to **vibrate in other than the axial direction**, e.g. in the vertical or horizontal direction. However, the or each roller may be **only reciprocated or only vibrated.***

*"Preferably, if more than one roller is continuously moved the rollers are **reciprocated** so that they are out of phase with one another."* (see page 1, lines 80-89, emphasis added).

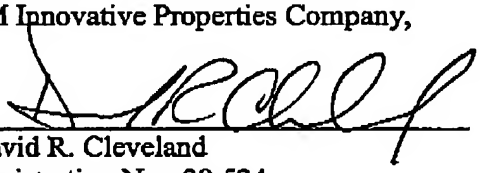
This passage and the discussion provided above concerning the mounting and gearing or Hall's rollers **3** in his support structure **2** make clear that Hall does not teach or suggest vibrating a plurality of his rollers in the direction of substrate motion and out of phase with one another.

Hall does not teach an apparatus "for improving the longitudinal uniformity of a wet coating on a substrate having a direction of motion comprising three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another" as recited in applicants' claims 1-4. Applicants accordingly request withdrawal of the rejection of claims 1-4 under 35 USC §103(a) as being unpatentable over Hall.

Conclusion

Applicants have made an earnest effort to address all issues raised in the Office Action. Neither Cheatham nor Hall shows or suggests an "improvement station for improving the longitudinal uniformity of a wet coating on a substrate having a direction of motion comprising three or more pick-and-place devices that contact the wet coating at a first position on the substrate and re-contact the wet coating at positions on the substrate whose lengths along the substrate with respect to the first position are not the same or integer multiples of one another". Applicants accordingly request reconsideration and withdrawal of the rejections and passage of their application to the issue branch.

Respectfully submitted on behalf of
3M Innovative Properties Company,



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